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MOUNTAIN BROOKLET STONEFLY-FAUNA
OF NORTHERN APENNINE

(Plecoptera)

Riassunto. — *La plecoterofauna di un ruscello montano dell'Appennino settentrionale.*

Gli Autori comunicano i risultati di un'indagine biennale sui Plecotteri insediati nel tratto sorgentizio (tra m 1.450 e m 1.500) di un corso d'acqua dell'Appennino emiliano: il torrente Lecca. Sono descritte le principali caratteristiche del biotopo, con particolare riguardo a quelle dell'acqua (temperatura, pH, dH ed ossigeno disciolto) ed i metodi di campionamento della plecoterofauna. Ciascuna delle 24 specie accertate è brevemente presa in esame, mettendone in evidenza le peculiarità ed elencando cronologicamente i reperti. La ripetizione mensile dei campionamenti ha consentito di appurare la successione delle mute immaginali e dei periodi di volo (Fig. 2). Dal punto di vista ecologico è stata analizzata la composizione qualitativa e quantitativa della plecoterocenosi, procedendo anche ad un confronto con le associazioni di altri corsi d'acqua sorgentizi nordappenninici, per valutare il grado di affinità. Infine viene esaminata la distribuzione geografica delle specie con particolare riferimento a quelle endemiche della regione italiana.

Abstract. — The Authors investigated during two years the head water (between 1,450 and 1,500 meters of altitude) of Lecca stream, a Northern Apenninian hill-torrent, in order to study its stonefly-fauna. The main characteristics of this biotope, especially those of the water (temperature, pH, dH, dissolved oxygen), and the methods used in collecting adults and nymphs, are briefly discussed. After an annotated list of the 24 species ascertained in the study area, the seasonal distribution of the emergences in the course of the year are taken into consideration. Then a few ecological peculiarities of the community are pointed out, with reference to the rheophile and orophile taxa, the relative abundance of the species and the affinity with other similar biotopes of Northern Apennine. Finally the geographical distribution of each species is discussed, with a particular reference to those endemic to the Italian region.

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Records of Stoneflies in the running water above m 1,400 in the Northern Apennines are very few; therefore, in order to contribute to the knowledge of these Insects, we have made a study in a cold mountain brooklet of this region, with the aim of ascertaining the stonefly-fauna, the phenology of the species and their ecological and geographical distribution. The water body taken into consideration is the upper section of Lecca stream, a tributary of the Taro river in the Emilian Apennine, from m 1,450 to the springs, which are at m 1,500 of altitude.

The biotope.

Lecca stream originates at m 1,500 above sea level, then runs in a coppiced beech-wood in a narrow little valley (Fig. 1). Near the springs the amount of water is that of a brooklet, in fact it has a depth of about cm 20 and a breadth varying from 30 to 90 cm; the speed of the current is more than m 1 per second, that is of torrential type. The brooklet, which never dries up, flows down from West to East on a stony bottom, covered here and there by dead leaves and twigs; mosses belonging to the genera *Bryum*, *Cratoneuron* and *Drepanocladus* grow on the emerging stones and all along the banks.

The main characteristics of the water at m 1,460, about m 180 downstream from the springs are: total hardness from dH 4 to 5.5; pH between 7 and 7.5; dissolved oxygen more than 95% of saturation; temperature, minima 3°C in January and November, maxima 10°C in July and in the first days of August. As the temperature at the springs varies only from 3°C in winter to 5°C in summer, the water temperature of the first 200 metres of Lecca stream is lower in summer and higher in winter than that of the air.

Methods.

This study was conducted from February 1976 to January 1978. In all the surveys, which have covered most of the year, we have examined the whole head water of the stream from m 1,450 to m 1,500, for a distance of about m 200.

The collections of nymphs were made by means of a strainer or a water net, in which the stoneflies dislodged when moving the stones, the dead leaves and the mosses, were carried downstream by the current. The adults were collected in winter and early in spring on the snow or on the shrubs skirting the water; from spring to autumn they were mainly collected with a beating net on the streamside vegetation especially on the branches of the beeches hanging over the stream. No adult was found from mid-November to February.



Fig. 1. — Head water of Lecca stream at m 1,450, June 12th 1977.

Fig. 1. — Il corso sorgentizio del torrente Lecca a m 1.450, il 12.VI.1977.

An annotated list of the species.

The 24 species which have been collected in this biotope, are listed here according to the systematic order used by AUBERT (1959) and ILLIES (1955), pointing out for each taxon the number of specimens collected, their geographical distribution and flight periods in the considered brooklet.

The following symbols are used in the text: sps. coll. for specimens collected, a. for adults, n. for nymphs.

1. *Rhabdiopteryx neglecta italica* AUBERT - (AUBERT 1951, 1959)

The race *italica* is endemic to the Italian region, where it has a wide diffusion in the submountain streams. Very rare in the study area. Sps. coll.: a. 1 ♀, 11.VI.1977.

2. *Protonemura ausonia* (CONSIGLIO) - (CONSIGLIO 1955; RAVIZZA & RAVIZZA DEMATTEIS 1977)

Endemic to the Italian region, recorded up today from scattered localities of the Apennines. Emergence occurs late in summer from the last days of August to October, with the heaviest emergence in September. Sps. coll.: n. 2 ♂♂ 3 ♀♀, 12.VIII.1976; a. 4 ♂♂ 5 ♀♀, 25.IX.1976; a. 1 ♀, 20.X.1976; a. 1 ♂ 1 ♀, n. 18 ♂♂ 32 ♀♀, 27.VIII.1977; a. 5 ♂♂ 4 ♀♀, 19.IX.1977; a. 5 ♀♀, 31.X.1977.

3. *Protonemura caprai* (AUBERT) - (AUBERT 1954)

Endemic to the Italian region, widely distributed in the Apenninian chain at elevations between 500 and 1,500 metres. Its emergence time extends from May to October.

Sps. coll.: a. 4 ♂♂ 1 ♀, 4.VI.1976; a. 3 ♂♂ 5 ♀♀, n. 7 ♂♂ 26 ♀♀, 15.VII.1976; a. 2 ♀♀, n. 8 ♂♂ 25 ♀♀, 12.VIII.1976; a. 7 ♂♂ 7 ♀♀, 25.IX.1976; a. 3 ♂♂ 2 ♀♀, n. 3 ♂♂ 12 ♀♀, 23.V.1977; a. 12 ♂♂ 23 ♀♀, n. 9 ♂♂ 13 ♀♀, 12.VI.1977; a. 6 ♂♂ 57 ♀♀, n. 4 ♂♂ 6 ♀♀, 27.VI.1977; a. 16 ♂♂ 11 ♀♀, n. 18 ♂♂ 18 ♀♀, 3.VIII.1977; a. 7 ♂♂ 7 ♀♀, n. 14 ♂♂ 30 ♀♀, 27.VIII.1977; a. 5 ♂♂, n. 2 ♂♂ 1 ♀, 19.IX.1977; a. 14 ♀♀, 31.X.1977.

4. *Protonemura elisabethae* RAVIZZA - (RAVIZZA 1976 a, 1977)

Endemic to the Italian region, where it was found in a few brooks and streams in the Northern Apennine, at elevations ranging from m 1,000 to m 1,500. It emerges from April to the first days of May; peak of emergence is in mid-April.

Sps. coll.: a. 14 ♂♂ 4 ♀♀, 10.IV.1976; a. 1 ♂ 1 ♀, 1.V.1976.

5. *Amphinemura sulcicollis* (STEPHENS) - (AUBERT 1959)

This species is a spring emerger, widely distributed in Europe and abundant in the running waters at low altitudes of Northern Italy. Very rare in the Apenninian brooks above m 1,200, as in the one considered. Sps. coll.: a. 1 ♀, 27.VI.1977.

6. *Nemoura cinerea selene* CONSIGLIO - (CONSIGLIO 1959)

Euro-Asiatic species occurring both in running and still waters from lower to higher altitudes. The race *selene* is distributed in all the Italian region. Apparently rare in the brook studied.

Sps. coll.: a. 1 ♂, n. 1 ♀, 23.V.1977; a. 1 ♂ 2 ♀ ♀, 11.VI.1977.

7. *Nemoura flexuosa* AUBERT - (AUBERT 1949, 1959)

It is a European species, recorded here and there in the running waters of the Italian region from low altitudes to the mountain horizon. Very rare in the study area.

Sps. coll.: a. 1 ♂, 12.VI.1977.

8. *Nemoura mortoni* RIS - (RIS 1902; AUBERT 1959)

Known from the mountain regions of Europe and widely distributed in the running waters of Northern Italy usually above m 1,000, this species emerges in the studied brook from June to July.

Sps. coll.: a. 2 ♂ ♂ 1 ♀, 4.VI.1976; a. 2 ♂ ♂ 6 ♀ ♀, 15.VII.1976; a. 1 ♂ 7 ♀ ♀, 12.VI.1977; a. 1 ♂ 30 ♀ ♀, 27.VI.1977; a. 12 ♀ ♀, 3.VIII.1977.

9. *Nemoura obtusa* RIS - (RIS 1902; AUBERT 1959)

It has the same distribution as the preceding species, it is usually found, together with the former, in the higher streams and brooks. Its emergence time is in summer from June to September.

Sps. coll.: a. 2 ♂ ♂ 1 ♀, 15.VII.1976; a. 2 ♀ ♀, 12.VIII.1976; a. 1 ♀, 25.IX.1976; a. 2 ♂ ♂, n. 1 ♀, 12.VI.1977; a. 7 ♂ ♂, 27.VI.1977; a. 4 ♂ ♂ 8 ♀ ♀, 3.VIII.1977; a. 1 ♂ 1 ♀, 27.VIII.1977.

10. *Nemurella pictetii* KLAPALEK - (AUBERT 1959)

Eurythermic species widely distributed in the Palearctic region. In the Apennines and in the Italian Alps this species was found between m 400 and m 2,200, both in still waters and in different types of running waters. As usually, it has a long flight-period extending from May to October.

Sps. coll.: a. 7 ♂ ♂ 1 ♀, 4.VI.1976; a. 6 ♂ ♂ 5 ♀ ♀, 15.VII.1976; a. 2 ♂ ♂ 1 ♀, n. 4 ♂ ♂ 19 ♀ ♀, 12.VIII.1976; a. 7 ♂ ♂ 5 ♀ ♀, 25.IX.1976; a. 1 ♂, n. 1 ♂, 23.V.1977; a. 4 ♂ ♂ 8 ♀ ♀, 12.VI.1977; a. 9 ♂ ♂ 52 ♀ ♀, 27.VI.1977; a. 1 ♂ 1 ♀, 3.VIII.1977; a. 1 ♀, 31.X.1977.

11. *Leuctra boreoni* AUBERT - (AUBERT 1962)

Endemic to the Italian region, distributed both in Northern Apennine and in the Ligurian-Maritime Alps. It is a summer-autumn emerger occurring from the last days of August to October, with a peak of emergence in September.

Sps. coll.: a. 12 ♂♂ 10 ♀♀, 25.IX.1976; a. 2 ♀♀, 20.X.1976; a. 2 ♂♂, 2 ♀♀, n. 14, 27.VIII.1977; a. 13 ♂♂ 1 ♀, 19.IX.1977; a. 4 ♂♂ 5 ♀♀, 31.X.1977.

12. *Leuctra concii* CONSIGLIO - (CONSIGLIO 1958)

Endemic to the Italian region, widely distributed in the Apennines and recently recorded by us in the Ligurian Alps (RAVIZZA & RAVIZZA DEMATTEIS 1976). Sporadic below m 1,000, it becomes common and locally abundant between 1,000 and 1,500 metres. Its emergence time extends from late in August to November, with the peak of emergence in September.

Sps. coll.: a. 60 ♂♂ 23 ♀♀, 25.IX.1976; a. 12 ♂♂ 28 ♀♀, 20.X.1976; n. 169, 3.VIII.1977; a. 13 ♂♂ 7 ♀♀, n. 54, 27.VIII.1977; a. 28 ♂♂ 14 ♀♀, n. 8, 19.IX.1977; a. 12 ♂♂ 22 ♀♀, 31.X.1977.

13. *Leuctra handlirschi* KEMPNEY - (AUBERT 1959)

Species distributed in Middle-Southern Europe, common in the Northern Apennine watercourses. Its flight-period extends from May to August, with the emergence peak in July.

Sps. coll.: a. 3 ♂♂ 3 ♀♀, 4.VI.1976; a. 25 ♂♂ 27 ♀♀, 15.VII.1976; a. 4 ♂♂ 10 ♀♀, 12.VIII.1976; a. 2 ♂♂ 1 ♀, 23.V.1977; a. 4 ♂♂ 4 ♀♀, 12.VI.1977; a. 21 ♂♂ 29 ♀♀, n. 11 ♂♂ 5 ♀♀, 27.VI.1977; a. 10 ♂♂ 52 ♀♀, 3.VIII.1977; a. 3 ♂♂ 5 ♀♀, 27.VIII.1977.

14. *Leuctra hippopus* (s.l.) KEMPNEY - (AUBERT 1959)

Widely distributed in all of Europe, it is represented in the stonefly-fauna of the examined biotope by a brachypterous form, occurring in a few Emilian brooklets above m 1,000, emerging during the winter from March to April. Sporadic adults were collected in May and in June.

Sps. coll.: a. 9 ♂♂ 8 ♀♀, 10.IV.1976; a. 1 ♀, 1.V.1976; a. 1 ♂ 1 ♀, 4.VI.1976; a. 15 ♂♂ 21 ♀♀, 5.III.1977.

15. *Leuctra insubrica* AUBERT - (AUBERT 1949, 1959)

Endemic to the Italian region, recorded from the Western Alps and from the Central-Northern Apennine, it inhabits mountain streams and brooks near the springs. Its emergence period extends from May to August.

Sps. coll.: a. 4 ♂♂ 12 ♀♀, 4.VI.1976; a. 2 ♂♂ 7 ♀♀, 15.VII.1976; a. 1 ♂, 12.VIII.1976; a. 1 ♂ 1 ♀, 23.V.1977; a. 22 ♂♂ 35 ♀♀, 12.VI.1977; a. 3 ♂♂ 9 ♀♀, 27.VI.1977; a. 2 ♂♂ 8 ♀♀, 3.VIII.1977.

16. *Capnioneura nemuroides* RIS - (AUBERT 1959)

It has a scattered distribution throughout Italy, fairly common but never abundant in Northern Apennine, except in the submountain course of Staffora stream (RAVIZZA 1974); its emergence time is in spring.

Sps. coll.: a. 1 ♀, 4.VI.1976.

17. *Capnopsis schilleri* (ROSTOCK) - (ILLIES 1955)

Distributed here and there in Europe, it was recorded from a few Italian localities, but probably it is more common in the mountain brooks of Northern Apennine. Emergence begins in June and continues to July.

Sps. coll.: a. 4 ♂♂ 6 ♀♀, 4.VI.1976; a. 3 ♀♀, 15.VII.1976; a. 4 ♀♀, 12.VI.1977; a. 2 ♂♂ 5 ♀♀, 27.VI.1977.

18. *Perlodes intricata* (PICTET) - (AUBERT 1959; BERTHÉLEMY 1964)

Distributed in the mountaineous regions of Europe, it inhabits different types of running waters at higher altitudes, occurring in the Italian Alps from m 1,500 to m 2,300 and more. Its emergence time extends from June to July.

Sps. coll.: a. 1 ♂, n. 3, 4.VI.1976; n. 1, 15.VII.1976; young n. 6 in Sept. and Oct. 1976; a. 1 ♀, 11.VI.1977; n. 2, 27.VII.1977; young n. 8 from Aug. to Oct. 1977.

19. *Isoperla carbonaria* AUBERT - (AUBERT 1953)

Endemic to the Italian region, occurring in the submountain water courses of the Apennines and Western Alps. It is rare in this biotope, where the three adults were collected at m 1,450, which is probably the superior limit of its altitudinal distribution. It emerges from June to July.

Sps. coll.: a. 1 ♂, 15.VII.1976; a. 1 ♂, 12.VI.1977; a. 1 ♀, 27.VI.1977.

20. *Isoperla rivulorum* (PICTET) - (AUBERT 1959)

Widely distributed in Europe; in Italy it belongs to the mountain community ranging from m 900 to m 2,200. Its flight-period extends from June to August, with a peak in July.

Sps. coll.: a. 1 ♂ 1 ♀, n. 5, 4.VI.1976; a. 6 ♂♂ 3 ♀♀, 15.VII.1976; a. 1 ♀, 12.VIII.1976; n. 2, 23.V.1977; a. 1 ♂ 3 ♀♀, 11.VI.1977; a. 7 ♀♀, 27.VI.1977; a. 2 ♀♀, 3.VIII.1977.

21. *Dinocras ferreri* (PICTET) - (AUBERT 1959)

Endemic to the Italian region, distributed on the Southern slopes of the Central-Western Alps and in Northern Apennine. Fairly common in mountain streams, but not abundant in brooklets like the first portion of Lecca stream.

Sps. coll.: a. 1 ♀, 15.VII.1976.

22. *Siphonoperla montana* (PICTET) - (ZWICK 1967, 1972)

Distributed in the mountain water courses of Central and Southern Europe; in the Italian Alps it occurs between 1,200 and 2,300 metres of altitude. In the study area its flight-period extends from May to July, with the heaviest emergence occurring early in June.

Sps. coll.: a. 8 ♂♂ 26 ♀♀, n. 1, 4.VI.1976; a. 29 ♀♀, 15.VII.1976; a. 7 ♂♂ 1 ♀, n. 8, 23.V.1977; a. 17 ♂♂ 24 ♀♀, 12.VI.1977; a. 6 ♂♂ 36 ♀♀, 27.VI.1977.

23. *Siphonoperla torrentium* (PICTET) - (ZWICK 1967, 1972)

It is a European species occurring in Northern Apennine from 500 to 1,500 metres of altitude. In the biotope studied, the emerging time seems to be restricted to June and July.

Sps. coll.: a. 1 ♂ 1 ♀, 4.VI.1976; a. 5 ♂♂ 6 ♀♀, 15.VII.1976; a. 1 ♂ 2 ♀♀, 12.VI.1977; a. 6 ♂♂ 14 ♀♀, 27.VI.1977.

24. *Chloroperla susemicheli* ZWICK - (ZWICK 1967)

Distributed between 500 and 2,000 metres in Central and Southern Europe. Sporadic in the studied water course, where its emergence time probably extends from July to August.

Sps. coll.: a. 1 ♂, 15.VII.1976.

Seasonal distribution.

Hiemal-emerging species are *Leuctra hippopus* (brachypterous form) and *Protonemura elisabethae*. It seems that the emergence time is governed mainly by temperature of water; emergence of *L. hippopus* begins when the water temperature rises above 4°C, while that of *P. elisabethae* starts when it rises above 5°C. For both species the superior limit of emergence is about 6°C. Most of the adults of *L. hippopus* were found walking on the snow, on the contrary all those of *P. elisabethae* were collected on the shrubs jutting out of the snow or on the branches of the beeches. In this biotope, we did not ascertain any specimen of

Leuctra niveola SCHMID, another winter-emerger, usually associated with the two above mentioned taxa in the nearest brooks of the Emilian Apennine.

The greater number of species emerges from May to August; at this altitude there is no clear difference between the emergence time

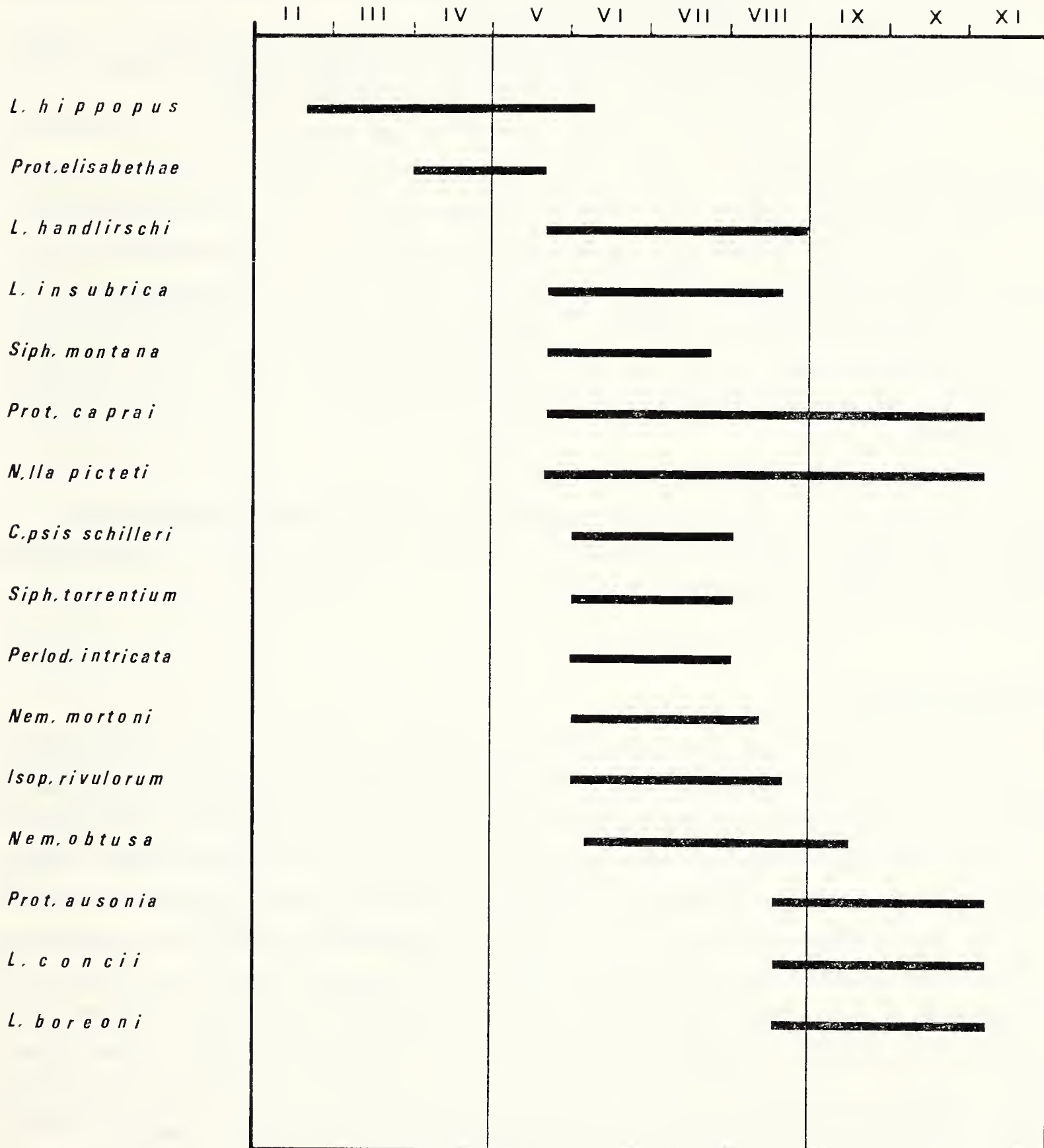


Fig. 2. — Seasonal distribution of adult stoneflies in the study area (sporadic species do not appear).

Fig. 2. — Periodi di volo dei Plecotteri insediati nel territorio studiato (le specie sporadiche non sono rappresentate).

of the spring species and the summer ones. The taxa belonging to the spring group emerge when the water temperature increases from 6 to 8°C. In May begins the flight-period of *Leuctra handlirschi*, *L. insubrica* and *Siphonoperla montana*, the emergence of which continues in June and July together with the ones emerging only in these months: *Nemoura cinerea selene*, *N. flexuosa*, *N. mortoni*, *Capnioneura nemuroides*, *Capnopsis schilleri*, *Dinocras ferreri*, *Perlodes intricata*, *Isoperla carbonaria*, *I. rivulorum* and *Siphonoperla torrentium*.

Protonemura caprai and *Nemurella pictetii* have a very long flight-period extending from May to the first days of November.

From June to August, months in which the water reaches maximum temperatures between 9 and 10°C, appear the adults of the two real summer-emerging species: *Nemoura obtusa* and *Chloroperla susemicheli*.

When the water temperature, after reaching the maximum in summer, in the last days of August decreases below 8°C, the emergence time of the autumnal species begins. They are only three: *Protonemura ausonia*, *Leuctra boreoni* and *L. concii*, which fly from the end of August to the beginning of November. After mid-November we did no longer find adults.

The seasonal distribution of stoneflies in the brooklet considered is shown in Figure 2, where the sporadic species do not appear, that is those which have been collected in a lower number than 5 specimens during the whole period of studies.

Ecological notes.

As we noticed in the introduction, large sections of the Northern Apennine are still unexplored as to their stonefly fauna. So we may only explain in general terms the characteristics of the ascertained community.

The stonefly fauna of the brooklet examined comprises both stenothermic and eurythermic species. The stenothermic ones, which constitute 91% of the community, may be grouped in rheophile-orophile, occurring in the cold water courses of the mountain horizon, which in Northern Apennine is above m 1,000-1,200, and in rheophile, having a wider altitudinal distribution ranging from lower to higher altitudes. The rheophile-orophile group includes *Protonemura ausonia*, *P. caprai*, *P. elisabethae*, *Nemoura mortoni*, *N. obtusa*, *Leuctra boreoni*, *L. concii*, *L. hippopus* (brachypterous form), *L. insubrica*, *Capnopsis schilleri*, *Dinocras ferreri*, *Isoperla rivulorum*, *Perlodes intricata*, *Siphonoperla montana* and *Chloroperla susemicheli*. The rheophile group includes *Rhabdiopteryx neglecta italica*, *Amphinemura sulcicollis*, *Leuctra handlirschi*, *Capnioneura nemuroides*, *Isoperla carbonaria* and *Siphonoperla torrentium*, which

are peculiar to the submountain community occurring between m 300-500 and 1,500 in Northern Italy. The eurythermic species are the ubiquitous *Nemoura cinerea selene* and *Nemurella pictetii*, occurring in all kind of lotic and lentic water bodies of the Italian region from the plains to high mountains.

The relative abundance of the species, gives us the possibility to estimate their degree of influence in the community. The 24 species collected in the investigated biotope are listed below; the number of specimens (adults and nymphs), which have been collected, is indicated in brackets.

<i>Leuc. concii</i> (460)	<i>Nem. mortoni</i> (62)	<i>Nem. cinerea selene</i> (4)
<i>Prot. caprai</i> (417)	<i>Leuc. hippopus</i> (56)	<i>Isop. carbonaria</i> (3)
<i>Leuc. handlirschi</i> (219)	<i>Siph. torrentium</i> (37)	<i>Nem. flexuosa</i> (2)
<i>Siph. montana</i> (160)	<i>Isop. rivulorum</i> (31)	<i>C. neura nemuroides</i> (1)
<i>N.lla pictetii</i> (112)	<i>Nem. obtusa</i> (29)	<i>Din. ferreri</i> (1)
<i>Leuc. insubrica</i> (111)	<i>C.psis schilleri</i> (24)	<i>Chlor. susemicheli</i> (1)
<i>Prot. ausonia</i> (77)	<i>Perl. intricata</i> (22)	<i>Amph. sulcicollis</i> (1)
<i>Leuc. boreoni</i> (65)	<i>Prot. elisabethae</i> (20)	<i>Rhabd. neglecta italica</i> (1)

Among these taxa, the first 6, each of them represented by a number of specimens exceeding 5% of the total collected, are predominant in the community; the subsequent 10 species may be considered as accessory elements, while the last 8 species, very few specimens of which were collected, are surely accidental ones.

From a synecological point of view, we may compare the community of the head water of Lecca stream, with those of three similar Northern Apennine biotopes recently investigated, that is the upper course of Staffora stream between m 1,300 and 1,343, where 23 species were collected ⁽¹⁾ (RAVIZZA 1974), that of Erro stream between m 700 and 750, where 29 species were collected (RAVIZZA 1976 b), and that of Parma stream at m 1,240-1,270 studied by us in 1976, where we found 32 species. A comparison among these communities in order to point out the number of species which are in common between Lecca and each of the above mentioned biotopes, enables us to estimate their different degree of affinity. Lecca and Parma communities have 22 species in common, while both Staffora and Erro communities have 16 species in common with

⁽¹⁾ In addition to the 21 species listed by RAVIZZA (1974), among a few specimens collected there on 16.IV.1975 by the senior author, we found 2 nymphs of *Nemoura mortoni* RIS and 2 exuviae ♂♂ of *Protonemura elisabethae* RAV., which increases the total number of species to 23.

Lecca. So the highest affinity is between the two nearer biotops belonging to the Emilian Apennine, while in the North-Western Apenninian head water streams, which originate from a lower mountain chain, the affinity is not so high.

Geographical distribution.

The stoneflies ascertained in the upper course of Lecca stream may be classed as follows

I. Species widely distributed in the Palearctic region:

Nemoura cinerea s.l. and *Nemurella pictetii* which occur throughout Europe and in parts of Asia.

II. Species with a more or less wide distribution in Europe:

Amphinemura sulcicollis, *Nemoura flexuosa*, *Leuctra hipposus* s.l. and *Capnopsis schilleri* are European elements; *Rhabdiopteryx neglecta* s.l., *Nemoura mortoni*, *N. obtusa*, *Leuctra handlirschi*, *Perlodes intricata*, *Isoperla rivulorum*, *Chloroperla susemicheli*, *Siphonoperla montana* and *S. torrentium* are distributed in the mountain stream in Central and Southern Europe.

Among these species we must point out the importance of the discovery of *Siphonoperla montana*, which had never been collected in the Apennines. Two other species, *Perlodes intricata* and *Chloroperla susemicheli*, were recorded up today in a few Apenninian localities, the former from Bolognola (AUBERT 1956) and Monte Cimone (FESTA 1949), the latter only from Monti Sibillini (ZWICK 1967); moreover a few specimens of both species were collected by us in the high Parma valley at m 1,240-1,270.

III. Species endemic to the Italian region:

this group includes taxa prevalently belonging to the high Apenninian community, it is the most interesting with reference to the distribution area covered by each species. *Leuctra insubrica*, *Dinocras ferreri* and *Isoperla carbonaria*, are diffused both on the Southern slopes of Central-Western Alps and in all Northern Apennine. *Protonemura caprai* and *P. elisabethae* are Apenninian forms related respectively with *P. lateralis* (PICTET) RIS and *P. nimborum* RIS. *Leuctra concii* is the Apenninian vicariant of *L. pseudocingulata* MENDEL occurring in Central Europe. The distribution of *Capnioneura nemuroides* in the Italian region is not much known; it was recorded in Sicily and in a few scattered

localities between Emilian Apennine and the Ligurian Alps. *Leuctra boreoni*, which occurs from Emilian Apennine to the Maritime Alps, is related with the Western Alpine *L. schmidi* AUB. Finally, the only autumnal Nemouridae *Protonemura ausonia* has no affinity with any Alpine species, but it is related to three South-Western European taxa, that is the Southern Apenninian *P. consiglioi* (AUB.), the Pyreneean *P. tuberculata* (DESP.) and *P. alcazaba* (AUB.) of Sierra Nevada.

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